

1 1. A method comprising:
2 receiving over a channel a signal including a desired portion associated
3 with a desired channel and an undesired portion mixed with said desired portion; and
4 recovering the desired portion from the signal by adaptively equalizing the
5 channel based on at least one of prior knowledge and empirical estimation of the desired
6 channel, and empirical estimation of the received signal auto-covariance.

1 2. The method of claim 1, receiving said signal including:
2 receiving the desired portion of the signal including desired channel
3 portions of said channel from a desired source;
4 receiving a priori information related to the desired portion over said
5 channel to derive said prior knowledge; and
6 receiving the undesired portion of the signal in a distorted form including
7 an interference from one or more interfering sources.

1 3. The method of claim 2, including:
2 using an array of at least two spatially separated antennas to receive the
3 signal into at least two propagating signal portions through at least two propagation paths.

1 4. The method of claim 3, including:
2 estimating a space-time cross-covariance matrix of the received signal and
3 the desired channel from said at least two propagating signal portions and said a priori
4 information related to the desired portion over a signal burst; and
5 deriving one or more equalizer coefficients that are based on averaging of
6 the received signal over a time window that is substantially same as the signal burst.

1 5. The method of claim 4, including:
2 adjusting each propagating signal portion of said at least two propagating
3 signal portions through said at least two propagation paths based on the one or more
4 equalizer coefficients to provide corresponding equalized outputs;
5 combining said equalized outputs into a common output to remove the
6 undesired portion from the received signal; and
7 applying a threshold decision criterion to the common output to recover
8 the desired portion from the received signal.

1 6. The method of claim 1, including:
2 receiving at least two propagating signal portions of the received signal
3 through at least two propagation paths;
4 observing the received signal patterns in the channel to derive said
5 empirical estimate;
6 extracting the undesired portion from the signal based on the empirical
7 estimate of the received signal;
8 averaging the temporal transitions of the interference patterns across the at
9 least two propagating signal portions to derive the desired portion from the received
10 signal;
11 operating on the channel using said at least two propagation paths to
12 compute a measure indicative of an average behavior of the channel; and
13 estimating the received signal based on said measure such that adaptively
14 equalizing the channel.

1 7. The method of claim 6, including providing an adaptive equalization by
2 periodically repeating the empirical estimation of the desired channel, and the received
3 signal auto-covariance.

1 8. The method of claim 1, including:
2 receiving one or more data symbols in the received signal over the
3 channel; and
4 estimating an auto-covariance matrix of the received signal and a cross-
5 covariance vector of the received signal and the transmitted one or more data symbols
6 by manipulating and averaging the received signal over at least two substantially equal
7 signal portions of the signal in parallel over a first and a second propagation paths.

1 9. The method of claim 8, including adaptively adjusting equalization
2 parameters of the channel based on a plurality of first samples of the received signal
3 collected in said first propagation path and a plurality of second samples of the received
4 signal collected in said second propagation path.

1 10. The method of claim 9, including:
2 operating on the channel in a dual reception mode in order to extract the
3 undesired portion to increase gain of the signal; and
4 separating said desired portion from said signal in said first and second
5 propagation paths by removing said undesired portion from the received signal.

1 11. An apparatus, comprising:
2 a processor;

3 a communication interface operably coupled to said processor to receive
4 over a channel a signal including a desired portion associated with a desired channel and
5 an undesired portion mixed with said desired portion; and
6 a device operably coupled to said processor to recover the desired portion
7 from the signal by adaptively equalizing the channel based on at least one of prior
8 knowledge and empirical estimation of the desired channel, and empirical estimation of
9 the received signal auto-covariance.

1 12. The apparatus of claim 11, wherein said communication interface includes
2 at least two antennas.

1 13. The apparatus of claim 11, wherein said device is a MODEM.

1 14. The apparatus of claim 13, wherein said MODEM includes an equalizer
2 capable of detecting said signal in the presence of at least one of co-channel and inter-
3 symbol interferences.

1 15. The apparatus of claim 14, wherein said MODEM is adapted to operate in
2 a cellular environment with time division multiple access to enable digital transmission of
3 the signal allowing a number of users to access a single radio frequency channel without
4 interference by allocating unique time slots to each user within each channel.

1 16. The apparatus of claim 11, wherein said device is an adaptive equalizer
2 providing a blind adaptive space-time equalization on said signal based on minimum
3 mean square error that reduces an interference in an asynchronous time division multiple
4 access cellular system.

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1 17. The apparatus of claim 11, said device to further:
2 receive at least two propagating signal portions of the received signal
3 through at least two propagation paths;
4 observe the received signal patterns in the channel to derive said empirical
5 estimate;
6 extract the undesired portion from the signal based on the empirical
7 estimate of the received signal;
8 average the temporal transitions of the interference patterns across the at
9 least two propagating signal portions to derive the desired portion from the received
10 signal;
11 operate on the channel using said at least two propagation paths to
12 compute a measure indicative of an average behavior of the channel;
13 estimate the received signal based on said measure such that adaptively
14 equalizing the channel; and
15 providing an adaptive equalization by periodically repeating the empirical
16 estimation of the desired channel, and the received signal auto-covariance.

1 18. The apparatus of claim 17, said device to further:
2 use an array of at least two spatially separated antennas to receive the
3 signal into at least two propagating signal portions through at least two propagation paths.

1 19. The apparatus of claim 18, said device to further:
2 estimate a space-time cross-covariance matrix of the received signal and
3 the desired channel from said at least two propagating signal portions and said a priori
4 information related to the desired portion over a signal burst; and

5 derive one or more equalizer coefficients that are based on averaging of
6 the received signal over one signal burst.

1 20. The apparatus of claim 19, said device to further:
2 adjust each propagating signal of said at least two propagating signal
3 portions through said at least two propagation paths based on the one or more equalizer
4 coefficients to provide corresponding equalized outputs;
5 combine said equalized outputs into a common output to remove the
6 undesired portion from the received signal; and
7 apply a threshold decision criterion to the common output to recover the
8 desired portion from the received signal.

1 21. A cellular phone, comprising:
2 a processor;
3 an array of at least two spatially separated antennas operably coupled to
4 said processor to receive over a channel a signal including a desired portion associated
5 with a desired channel and an undesired portion mixed with said desired portion into at
6 least two propagating signal portions through at least two propagation paths;
7 a MODEM operably coupled to both said processor and said array of at
8 least two spatially separated antennas to recover the desired portion from the signal by
9 adaptively equalizing the channel based on at least one of prior knowledge and empirical
10 estimation of the desired channel, and empirical estimation of the received signal auto-
11 covariance.

1 22. The cellular phone of claim 21, further including an adaptive equalizer to
2 provide a blind adaptive space-time equalization on said signal based on minimum mean
3 square error.

1 23. The cellular phone of claim 22 is adapted to operate on the signal in a
2 cellular environment with time division multiple access to enable a general packet radio
3 service over a network for global system for mobile communications.

1 24. A mobile device, comprising:
2 a processor;
3 an array of at least two spatially separated antennas operably coupled to
4 said processor to receive over a channel a signal including a desired portion associated
5 with a desired channel and an undesired portion mixed with said desired portion into at
6 least two propagating signal portions through at least two propagation paths; and
7 a MODEM operably coupled to both said processor and said array of at
8 least two spatially separated antennas to recover the desired portion from the signal by
9 adaptively equalizing the channel based on at least one of prior knowledge and empirical
10 estimation of the desired channel, and empirical estimation of the received signal auto-
11 covariance.

1 25. The mobile device of claim 24, further including an adaptive equalizer to
2 provide a blind adaptive space-time equalization on said signal based on minimum mean
3 square error.

1 26. The mobile device of claim 24 is adapted to operate on the signal in a
2 cellular environment with time division multiple access to enable a general packet radio
3 service over a network for global system for mobile communications.

1 27. An article comprising a medium storing instructions that enable a
2 processor-based system to:
3 receive over a channel a signal including a desired portion associated with
4 a desired channel and an undesired portion mixed with said desired portion; and
5 recover the desired portion from the signal by adaptively equalizing the
6 channel based on at least one of prior knowledge and empirical estimation of the desired
7 channel, and empirical estimation of the received signal auto-covariance.

1 28. The method of claim 27, further storing instructions that enable the
2 processor-based system to including employing adaptive equalization by periodically
3 repeating the empirical estimation of the desired channel, and the received signal auto-
4 covariance.

1 29. The article of claim 28, further storing instructions that enable the
2 processor-based system to use an array of at least two spatially separated antennas to
3 provide the signal into at least two propagating signal portions through at least to
4 propagation paths.

1 30. The article of claim 29, further storing instructions that enable the
2 processor-based system to:

3 estimate a space-time cross-covariance matrix of the received signal and
4 the desired channel from said at least two propagating signal portions and said a priori
5 information related to the desired portion over a signal burst;
6 derive one or more equalizer coefficients that are based on the average of
7 the received signal over a time window that is substantially same as the signal burst;
8 adjust each propagating signal portion of said at least two propagating
9 signal portions through said at least two propagation paths based on the one or more
10 equalizer coefficients to provide corresponding equalized outputs;
11 combine said equalized outputs into a common output to remove the
12 undesired portion from the received signal; and
13 apply a threshold decision criterion to the common output to recover the
14 desired portion from the received signal.